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UNIDO PROGRAMME ON CLEANER INDUSTRIAL PRODUCTION

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Summary

Describes the UNIDO programme on cleaner industrial production with particular emphasis on the joint UNIDO/UNEP programme of National Cleaner Production Centres (NCPCs), its objectives and implementation approach, draws attention to the need for worldwide implementation of cleaner production and emphasizes the importance of international networking in the promotion of the concept.

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Introduction

1. Industrialization is a cornerstone of socio-economic progress and a crucial engine of economic growth, especially in developing countries. In the past, the selection of technologies and industry components was based mainly on financial considerations with a view to maximizing economic output and practically little, if no, input as regards environmental issues was included in the planning process. This lack of concern for environmental matters has led to serious pollution and toxification of our planet's elements of air, water and earth.

2. Technologies presently used in developed countries show that industrial development can be well harmonized with environmental and habitat demands. The development of appropriate policies and of environmentally friendly technologies, as well as the implementation of industrial standards have contributed to this harmonization. Ecologically sustainable development implies that financial feasibility is analysed only after taking health, safety and environmental concerns into consideration.

3. Although the situation has generally improved, financial interests are still often overwhelming, especially in developing countries. The challenge faced by developed and developing countries is to change industrialization patterns by shifting to environmentally friendly technologies, reducing end-of-pipe treatments and increasing the recycling of materials. The reduction of industrial pollution by means of cleaner production has been identified as the key to ecologically sustainable industrial development. This is why cleaner industrial production, which improves environmental quality and often enhances profitability, can foster economic activity and offer new opportunities to industrialization. New incentives and an increase in competitiveness are elements frequently associated with process improvements. Those elements are also inherent in ecologically sustainable development and demonstrate that environment is not against business but creates new possibilities through the introduction and enforcement of better technologies and management systems.

4. In the face of pollution resulting from industrial production, the role of the United Nations Industrial Development Organization (UNIDO), as a specialized United Nations agency, is to provide assistance to developing countries to help them achieve an ecologically sustainable development of industry. Cleaner industrial production is an important element of the UNIDO environment programme since 1990. This concept was endorsed by UNIDO Member States in the conclusions and recommendations of the Conference on Ecologically Sustainable Industrial Development (ESID), held by UNIDO in 1991, and was accepted by the 1992 United Nations Conference on Environment and Development (UNCED) as one of the primary tools for industry to achieve environmental improvements while remaining competitive and profitable.

I. CLEANER INDUSTRIAL PRODUCTION

5. Cleaner industrial production is an integrated preventive strategy applied to processes and products in order to increase efficiency and reduce risks to humans and the environment. For production processes, cleaner production includes the efficient use of raw materials, water and energy, the elimination of toxic or dangerous materials and the reduction of emissions and wastes at the source. For products, the strategy focuses on reducing negative impacts - by appropriate product design - along the entire life cycle of a product, from raw material extraction to the ultimate disposal of the product.

6. One of the misconceptions among industries in developing countries has been that environmental protection is a cost-incurring activity and cannot be sustained without non-productive cash outlays. This notion has often led to weak implementation of environmental strategies and lack of conviction among the implementing authorities. However, there is growing evidence that waste minimization not only helps to reduce pollutant discharge by as much as 25 to 50 per cent, but that it also can be a profitable business decision. Cleaner industrial production often results in economic improvement to the process, the benefits being further enhanced when the manufacturer has to face pollution charges or the cost of dealing with waste through treatment or disposal. In addition to this economic incentive, cleaner industrial production is a preferential instrument to meet legal requirements and avoid penalties, or to build a corporate policy to improve the image of the company and to obtain public support to industrial development.

7. Furthermore, cleaner industrial production requires a shift in thinking away from end-of-pipe treatment of industrial pollutants towards prevention altogether. The techniques and technologies for cleaner production go beyond the technologies for pollution abatement and waste disposal: they embrace inside-the-factory changes in operating procedures, input materials, process technologies, onsite recycling and even products themselves. A new generation of technologies and processes is being developed by which the "clean" concept is approached in the research and development stages and constitutes the future manufacturing system. However, until this new manufacturing system is in place, cleaner production applied to present manufacturing systems is the immediate answer to sustainable development, as it will also enhance the learning process which will, in turn, speed up the shift to new environmentally sound technologies.

II. THE NEED FOR ACTION

8. Despite the advantages of cleaner industrial production and a growing interest from developed and developing countries, there are some barriers that prevent or make its worldwide implementation difficult. Major barriers to the implementation of cleaner production are lack of knowledge of the appropriate technology, lack of technical expertise in the methodology of process assessment and diagnosis, lack of financial resources, lack of awareness and resistance to new ideas. Other major barriers are government policies and regulations that focus on single-medium pollutant reductions and those that offer incentives for investment in end-of-pipe technologies.

policy, institutional and enterprise levels, UNIDO supports National Cleaner Production Centres.

A. Policy level: ecologically sustainable industrial development (ESID) strategies

12. Existing government policies often encourage the excessive use of resources by incorrect pricing or subsidies, or they assign preference to traditional end-of-pipe pollution control over pollution prevention. UNIDO is working with a number of countries in the preparation of ESID strategies that are aimed at formulating government policies and programmes that promote cleaner production as an essential element of sustainable development plans. These efforts include reviews of existing industrial, environmental and technology policies in order to identify those policy components that discourage cleaner production and to formulate alternative, proactive policies that encourage cleaner production.

> *An example of UNIDO activities at the policy level is the International Conference on Economic Growth with Clean Production, which was held jointly by the Commonwealth Scientific and Industrial Research Organization and UNIDO at Melbourne, Australia, in February 1994. Representatives of Governments as well as of industry and scientific and technological institutions participated in three days of debate and discussion during which practical approaches to ecologically sustainable industrial development were identified. Cleaner production issues specific to 12 industries, including leather, textiles, mineral-processing, metal-finishing and mining, were discussed in detail in separate workshops within the framework of the Conference. A set of 10 guiding principles for the achievement of sustainable development was drawn up by the Conference. These, the Melbourne Principles, emphasize, as prerequisites to the achievement of an ecologically sustainable industrial development, the importance of cooperation between Governments, industry and research institutions in both developed and developing countries.*

B. Institutional level: capacity-building programmes

13. Capacity-building and transfer of technology are given major attention by UNIDO. The expertise accumulated by UNIDO through years of experience is now being introduced in a set of guidelines to be used in plant audits and assessment of cleaner technologies available. Furthermore, UNIDO recognizes the importance of well-trained, fully equipped and well-informed public- and private-sector institutions promoting cleaner industrial production and therefore provides institutional support and information about cleaner production to governmental and non-governmental organizations.

14. For instance, to create permanent awareness and to strengthen human and institutional capability to respond to ecologically sustainable development issues, UNIDO has set up a self-learning training course in kit form. Its main component, a manual with distinct learning units, covers: the need for ecologically sustainable development and its definition; cleaner

production; analytical tools for identifying cleaner production opportunities; economic techniques for cleaner production; the role of Governments in environmental management; how to obtain information about cleaner production and how to incorporate environmental considerations into project design.

Activities at the institutional level include support for cleaner production programmes within environmental management agencies. Among others, UNIDO is working on such a project with the Central Environment Authority of Sri Lanka. It is building the capacity of the Authority to use waste-reduction measures as the first step in achieving industrial compliance with environmental norms, and is also providing seed money from a revolving fund for low-cost cleaner technologies. UNIDO is starting a similar project with the environmental authority of Nepal.

C. Enterprise level: demonstration programmes

15. UNIDO supports individual sectors that are interested in introducing cleaner production programmes into their activities. Support in the transfer of cleaner technology covers, in particular, the following industries: leather and leather products, agro-industries, wood products, textiles, chemicals, pharmaceuticals and biotechnology, pulp and paper, metallurgy and engineering and machine tools. Specific projects or programmes at the national or regional levels are carried out with emphasis on resource efficiency (chemicals, water, energy and raw materials), pollution prevention, waste recovery and recycling measures as a primary objective and effluent treatment/pollutant treatment as an adjunct measure. Some recently completed activities are in the cement sector in Egypt and the cane sugar sector in Mexico. A demonstration in the metal-finishing sector is currently under way in Pakistan.

16. UNIDO is also committed to ensuring that gender issues are carefully considered in the process of shaping the concepts of sustainable technology. Women entrepreneurs in small-scale industries are typically using old, inefficient, polluting and unsafe machinery. The challenges to supplying women with improved access to cleaner technologies are very similar to those of increasing their access to technology in general. UNIDO databanks provide businesswomen in the manufacturing sector with information on cleaner production and conducts training programmes, workshops and awareness raising campaigns related to cleaner production methods. UNIDO projects to improve local environments have a strong community focus, to empower local women, and provide them with new techniques and technologies, for example in waste management or recycling.

At the enterprise level, UNIDO activities include a project in India, "Demonstrations with Small Industries of Reductions in Emissions and Wastes" (DESIRE), carried out in cooperation with the National Productivity Council of that country. UNIDO has supported demonstrations of the potential of waste minimization in three sectors: agro-based pulp and paper; pesticide formulation; and textile dyeing and finishing. The 12 participating plants implemented 210 options with an investment of approximately $300,000 which, in turn, resulted in monetary savings of approximatley $3 million. In the case of the pulp, paper and textile sectors, there was a significant reduction in the

volume of water used and organic matter discharged into the environment. In the case of pesticides formulation, there was a significant reduction in toxic fugitive emissions and health hazards risk.

In the field of pesticides, a large percentage of women, especially in developing countries, are involved in the production, handling, transportation and actual application of pesticides. UNIDO has been implementing a comprehensive programme to assist developing countries in tackling this problem through the promotion of clean technologies, low volume, low risk, and environmentally friendly pesticides.

D. National Cleaner Production Centres (NCPCs)

17. As a cost-effective, policy-providing, sustainable capacity-building and demonstration effort, UNIDO, in cooperation with the United Nations Environment Programme (UNEP), has launched a new programme to support National Cleaner Production Centres. The Centres are meant to play a coordinating and catalytic role in cleaner production by providing technical information and advice, stimulation and demonstration of cleaner production techniques and technologies as well as training industry and government professionals. The programme will build capacity to develop and implement cleaner production strategies at the national level and will support NCPCs in approximately 20 countries for five years, after which they will be expected to be self-sufficient.

18. To promote the programme, UNIDO and UNEP are working with industry-oriented institutions such as national productivity councils, chambers of commerce, industrial Non-governmental Organizations (NGOs) and technical universities. NCPCs are located at, and supported by, existing institutions and are managed by experienced nationals of the countries concerned. NCPCs will serve as focal point for cleaner production with the following aims:

- Promotion of the cleaner production concept at the policy, institutional and enterprise levels;
- Organization of demonstration projects in industrial establishments;
- Conducting audits for industrial emissions and wastes;
- Dissemination of information on cleaner industrial production and facilitation of appropriate technology transfer;
- Production of technical publications;
- Training in cleaner production practices;
- Identification of obstacles, and provision of solutions, to the implementation of cleaner industrial production techniques and technologies;
- Collection of information on experience gained by NCPCs for storage in an information management system for exchange with other NCPCs and provision to programme management for wider distribution.

19. During 1995, eight NCPCs were set up in the following countries:

Africa: United Republic of Tanzania and Zimbabwe
Asia: China and India
Latin America: Brazil and Mexico
Central and Eastern Europe: Czech Republic and Slovakia

20. UNIDO/UNEP support will be provided to the centres for a three-year period and will include demonstration projects at selected industrial sectors, training, expertise and services of national and international consultants as well as information material on cleaner industrial production.

21. During the biennium 1996-1997, high priority will be given to the expansion of the NCPC programme. Based on solicitations received from existing industry-oriented institutions, UNIDO/UNEP will preselect the institutions as possible hosts for the establishment of NCPCs. Subsequently, one to three representatives of each potential host institution will attend a one-month training programme in Europe. Finally, UNIDO/UNEP will jointly select the final host institutions for NCPCs.

One already existing NCPC, the China National Cleaner Production Centre, was set up at the Chinese Research Academy for Environmental Science. IVAM Environmental Research, Netherlands, was contracted as the counterpart institution to assist in training and demonstration activities. The core activities of the Centre will consist of two industry-sector demonstration projects in the non-wood pulp and paper industry (approximately six participating mills) and in breweries (at least two participating enterprises). Additional activities will be undertaken to establish an institutional framework for the promotion of cleaner production in China, including, but not limited to, establishing regional and/or industry sector cleaner production training and technical cooperation centres.

IV. OUTLOOK

A. International networking

22. The potential of promoting cleaner production and implementing successfully the concept depends on how well the goals of cleaner industrial production can be reached. These goals consist of a three-step process: integration of cleaner production in the industrial management systems, followed by demonstration projects and, finally, dissemination of the results. The three steps are explicated below.

Integration: The primary goal, the integration of cleaner production considerations into all aspects of standard industrial practice, is the most significant indicator of the penetration of cleaner production techniques and technologies. Only then will cleaner production become

a sustained, continuous effort to reduce the source and pollution intensity of existing as well as new processes and products. Taking this criterion into consideration, cleaner production programmes have not yet fully met this goal. There has been only limited penetration of the preventive approach into standard industrial practices and industrial support institutions.

Demonstration: The next step in the promotion of cleaner production is the implementation of in-plant demonstrations that exploit the readily available source reduction measures for existing processes and products and that can inspire a small number of "innovative" enterprises to implement similar measures. In-plant demonstration is the best instrument to convince many experts who are sceptical about the potential for changing the entrepreneurial culture, particularly in small and medium enterprises in developing countries.

Dissemination: Once the industrial production concept has penetrated all aspects of standard industrial practice and demonstration projects have been carried out to obtain a multiplier effect, the results of these efforts have to be disseminated to a large number of plants in the industrial sector. The present capacity of information systems should be used, completed and expanded to disseminate the concept. In an effort to contribute to this important issue, UNIDO collects information and available expertise on cleaner industrial production worldwide, to complete its present information system and to disseminate the information to interested institutions, Governments and individuals, especially through the National Cleaner Production Centres.

23. The implementation of the concept therefore calls for the participation of Governments, governmental and non-governmental organizations, business, and many other groups as well as individuals at the international, national and local levels.

24. To reduce wastes, Governments have to change their policies and emphasize pollution prevention as a first priority. Intergovernmental organizations should coordinate their action and promote the concept in their specific fields of activity. Non-governmental Organizations, in particular technical and environmental institutions, could be important promoters of the cleaner production concept at the international, regional and national levels. They have an important role to play in diffusing this concept, by putting pressure on policy makers and by helping to change attitudes, especially in small and medium enterprises.

25. Within the United Nations system, UNIDO is the only organization with extensive work experience within the manufacturing sector. UNIDO promotes cleaner production to satisfy the new demands of society and the needs of developing countries. It can bring to the field of cleaner production both its internal cross-sectoral and subsectoral expertise and use its field network to monitor and assist demonstration projects and National Cleaner Production Centres. It contributes to the implementation of cleaner production by incorporating applied information systems for an effective use of computer technology that promotes safe and cleaner industry. Finally, UNIDO can draw on its network of experts, both the methodology of cleaner production assessments and knowledge of subsector process options for reducing wastes and optimizing the manufacturing processes.

B. A world-wide cleaner industrial production policy

26. Sustainable development is a multidimensional concept with a number of interrelated aspects including ecological, environmental, economic, technological, social, cultural, ethical and political dimensions. A sustainable future of our planet will require shifts in personal values, beliefs, attitudes and goals, as well as substantial changes in economic, social and political practices.

27. Environmental concerns, both at the global and national levels, have attracted the attention of the public at large and emerged at the forefront of the international policy agenda over the last two decades. With the adoption of Agenda 21 by UNCED in 1992 and the conclusion of several conventions, the world community has a very comprehensive international policy statement on the need to attain ecologically sustainable patterns of development. Agenda 21 has profound implications for industry and industrialization patterns as it stresses the need to ensure the protection and conservation of environmental resources in the most cost-efficient manner.

28. Pollution and toxification of the environment have been identified as a major issue but have not yet received a proportionate international response in the form of a convention or a legal agreement. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal is the single international treaty addressing the issue of toxic chemicals. However, it focuses on controlling transboundary movement and the disposal of hazardous wastes and does not address the need for a global effort related to the prevention of pollution and toxification which is left to the parties of the convention. At the time being, cleaner production - which should be playing this important role - is not supported by any specific agreement or convention.

29. The situation is partly due to varying perceptions of the public of the need for cleaner industrial production. Pollution and toxification of our environment by unsound production systems are very often perceived as local rather than global problems. The time has come to correct this limited perception. The harmful impacts from substantial deposition of pollutants and chemicals have so far been relatively limited because most ecosystems - soils, sediments and wetlands - have the capacity to store and immobilize toxic chemicals for a long period of time. Once the ecosystem reaches its capacity to store pollutants, the unexpected and sudden release of chemicals and pollutants will have harmful effects on our environment. As many sources of water become increasingly polluted and natural soils unusable for agricultural cultivation, population migration in search of habitable areas will follow, leading to instability, at both the national and the international levels.

30. It is expected that world population and per capita income will further increase in the future. As industrial production is a driving force in the increase of per capita income, every attempt has to be made to reconcile economic growth with ecologically sustainable development.

V. CONCLUSIONS

Cleaner industrial production is an immediate need for industry.

31. Cleaner production represents an immediate and urgent need for industry until a new generation of technologies and processes takes over from the present manufacturing systems. New technologies will help to introduce environmental concerns at the research and development stages, but a full package of innovative technologies will not be available for several years.

This preventive approach has not been given enough attention as compared to other environmental issues.

32. Meanwhile, cleaner industrial production is the best way to cope with many environmental issues. UNIDO experience shows that waste can be easily reduced at the source, at no cost, or with a payback period of less than one year. Even those industries that have already incorporated end-of-pipe solutions for pollution control have a real interest in applying cleaner production. Furthermore, cleaner industrial production can act as a driving force in revising the manufacturing system that can enhance the benefits achieved through production.

UNIDO promotes cleaner production through the integration of the concept into management systems, demonstration projects and dissemination of results.

33. Once the principle of waste minimization is integrated into all aspects of standard industrial practice, and the implementation of in-plant cleaner production demonstrations and the dissemination of their results are achieved, cleaner production will be widely accepted as a sustainable and continuous effort to reduce industrial production waste. Cleaner production represents the most efficient means in efforts to limit potential damage to the environment emanating from today's technologies and, at the same time, to achieve sustainability while stimulating industrial development. It is the role of Governments, intergovernmental and non-governmental organizations as well as individuals to join efforts in the implementation of the concept.

Cleaner industrial production needs adequate financing, especially for small- and medium-sized industries. A global funding system would help to prevent the foreseen social and environmental problems resulting from industrial pollution.

34. After the demonstration has been made of the universal importance of cleaner production, the establishment of a funding system similar to the Montreal Protocol on Substances that Deplete the Ozone Layer, or the inclusion of the cleaner production concept in a present funding system such as the Global Environment Facility (GEF), is essential. A global fund would represent a significant acknowledgement of the responsibility for individual countries to join in a combined effort for the common good.